

## Foundation . . . Satellite Ground Antenna Services

### Core Customers



### Core Services

- Logistics & Sustainment
- Operations & Maintenance
- Systems Integration
- Technical & Engineering Services
- Information Services



### Value Proposition

- People, Processes, and Program Management
- Reliability
- Reduced Cost of Ownership
- Mission Readiness
- Operational Efficiency

### Differentiators

- Domain Knowledge
- Government Assets Integration
  - USAF
  - NASA
  - Navy
- Past Performance
  - Support of Over 700 Satellites
- Corporate Reachback
  - Products
  - Services
  - Laboratory
- Technology
  - Lights Out Operations
  - Rules Based Operations
  - Vanishing Vendor Program
- **Six Sigma**
- Premier HS&E



**Driving Growth, Productivity,  
Performance and DigitalWorks**

## The Quality Journey

### Today

- Six Sigma Variation Reduction
- Lean
- High Performance Work Organizations
- Digital Works
- Process Focused
- Design for Six Sigma (DFSS)
- Green Belt for Growth (GBFG)



### “Plus”

#### Process Applications:

- DigitalWorks
- ISO Quality Standards
- Design to Cost (ABM)
- Mfg Strategy - Make/Buy (ABM)
- Re-engineering Administration
- Value Creation

#### Tool Sets:

- DFSS – Hardware & Software
- Baldrige Assessment
- ABM - Profitability Analysis
- Root Cause Corrective Action

THE PATH TO SUCCESS

1994 - Customer Excellence  
Technical Excellence, TQ Speed

1993 - Operational Excellence  
TQII, Lean & Visual Workplace

1993 - Customer Linked Manufacturing  
Customer Linked Commercialization

1992 - Materials Excellence  
Employee Excellence

1991  
Total Quality

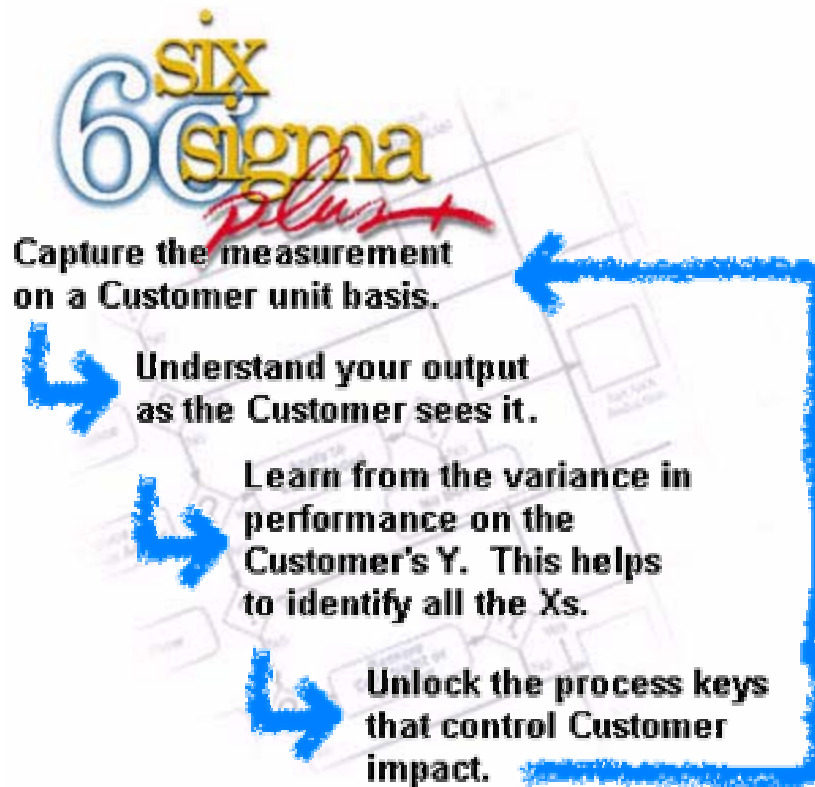
**TQM has phased out  
... Six Sigma is going  
stronger than ever  
after more than 10  
years**

- Honeywell's **overall strategy** to:
  - Delight the Customer
  - Involve the Customer where possible
  - Accelerate improvements in **all** processes, products & services
  - Reduce cost of poor quality by eliminating waste and reducing defects and variations
  - Celebrate and Promote Achievements



HON employees drive Six Sigma Continuous Improvement at ALL levels of the organization:

- Green Belts
- Black Belts
- Executive Black Belts
- Master Black Belts
- Sponsors
- Champions



- **Six Sigma**- Defect and Variation Reduction in All Processes
- **Design for Six Sigma (DFSS)** - Focus on Engineering
- **Green Belt for Growth** - Focus on Sales and Marketing
- **Lean/Kaizen**- Waste Reduction in All Processes

.....

**ISO** ensures proper Command Media once Improvements are in Place

- **Six Sigma is all about Customer Critical To Quality Characteristics (CTQs)**
- **Proven way to drive financial & performance excellence**
- **Appropriate for every business & function**
- **Provides many tools, aids, skills**
- **Drives fact-based decision making & breakthrough thinking**

**Six Sigma = methodology/approach + processes + tools**



- Metric
- Benchmark
- Vision
- Philosophy
- Method
- Tool
- Symbol
- Goal
- Value

- Sigma is a letter in the Greek alphabet.
- The term "*sigma*" is used to designate the distribution or spread about the mean (average) of any process or product characteristic
- For a business or manufacturing process, the *sigma value* is a metric that indicates how well that process is performing, compared to the bench mark of  $6\sigma$ . The higher the sigma value, the better. Sigma measures the capability of the process to perform defect-free-work. A defect is anything that may results in customer dissatisfaction.
- With six sigma, the common measurement index is "*defects-per unit*," where a unit can be virtually anything -- a component, piece of material, line of code, administrative form, time frame, distance, etc.
- The *sigma value* indicates how often defects are likely to occur. The higher the sigma value, the less likely a process will produce defects. As sigma increases, costs go down, cycle time goes down, and customer satisfaction goes up.

## Sigma--Our Measurement

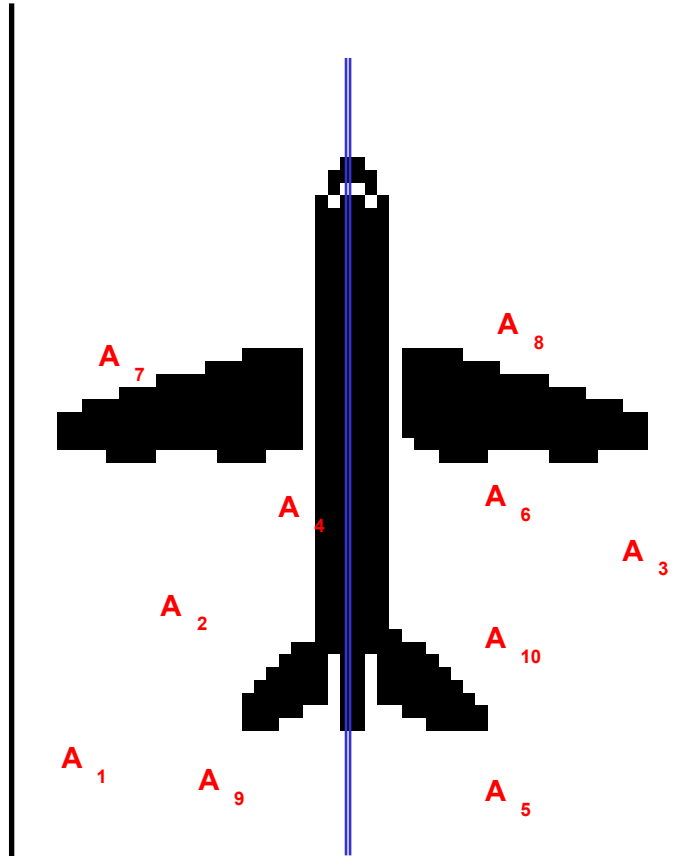
	<u>Defects/million</u>	<u>Error-free Rate</u>
• <b>Six Sigma</b>	<b>3.4</b>	<b>99.9997%</b>
• <i>Five Sigma</i>	233	99.977%
• <i>Four Sigma</i>	6,210	99.4%
• <i>Three Sigma</i>	66,810	93%



# Why Strive for Six Sigma?

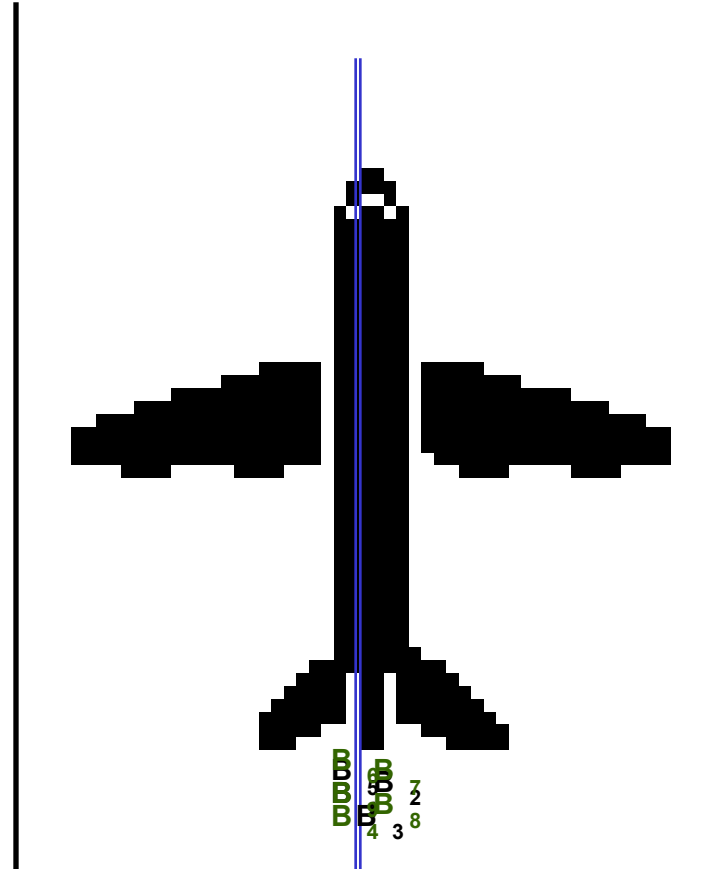
- If electricity worked at:
  - $4\sigma$  no lights about 1 hour/week
  - $6\sigma$  no lights about 2 seconds/week
- Driving 40 miles per hour if your car operated at:
  - $4\sigma$  30 repair minutes every 3,000 miles
  - $6\sigma$  30 repair minutes every 6,000,000 miles
- NENS Proficiency metric:
  - $4\sigma$  6 minutes of data loss every 1000 minutes
  - $6\sigma$  0.003 minutes of data loss every 1000 minutes

Pilot A



Landings with Pilot A

Pilot B

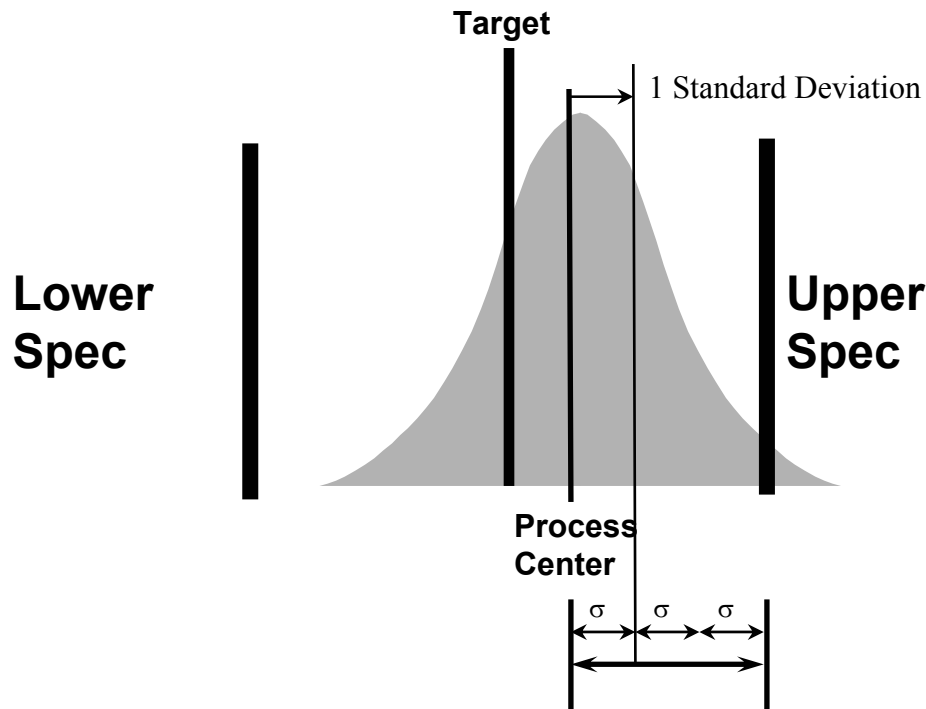


Landings with Pilot B

## Which pilot do you want to fly with??

# Definition of Six Sigma (Statistical)

- Sigma is a term used to refer to standard deviation, which is a measure of variation or “scatter” in a process (or distribution)
  - One standard deviation can be graphically shown on a normal distribution as the distance between the mean of the distribution and the first point of inflection in the curve
- Six Sigma refers to a process having 6 standard deviations between the process center and the nearest specification limit.



The “Sigma Level” of a process is the number of standard deviations between the center of the process and the CLOSEST specification limit.

**What is the Sigma Level of this process?**

**How can we improve this level???**

- 100% Inspection Inefficient
- Management *Commitment* is KEY
- Six Sigma is Focused on the Process
- Continuous Improvement is a Philosophy of Doing Business
- Reduction of Variation

**If we cannot express what we know in numbers, we don't know much about it ...**

**If we don't know much about it, we cannot control it ...**

**If we cannot control it, we are at the mercy of chance**

- Variation exists in everything
- In some cases variation is so small that it is difficult to detect, but it is there
- If it is assumed that everything is a result of some process, then it is rational to conclude that the process introduces product variation
- Variation in the product is due to variation in the process itself

**Variation is the ENEMY**

- There is one element in process control which is critical. The relationship between significant (critical) product characteristics and significant (critical) process parameters must be established. The methodology to implement and utilize process control must be evolutionary, not haphazard. For this to occur, there must be a logical sequence of steps to control and improve a process which is related to product results.
- It should be realized that by focusing on and *improving the process*, product quality will continually improve. Ultimately, it must also be recognized that all phases of a process must be considered for continuous improvement (i.e., inception, design and development, prototype, production, service/warranty, etc.).

$$Y = f(X)$$

**Outputs are a function of inputs ... The key is unlocking which inputs are the critical few among the trivial many**

By knowing and Controlling the X's, we reduce the Variability in Y, which decrease the number of defects, improves RTY and Cycle Time and Capacity. We also can eliminate or reduce inspection, test and rework.

- Our Outputs (Y) are determined by our Inputs (X's). If we know enough about our X's we can accurately predict Y.
- If we don't know much about our X's, then we have to resort to Inspection and Test (Non-value-Added Operations)

$$Y = f(X_1, X_2, X_3, \dots, X_k)$$

## Reaching Six Sigma Performance

- Use this **method** to solve problems:
  - **Define** problems in processes
  - **Measure** performance
  - **Analyze** causes of problems
  - **Improve** processes -- remove variations and non value-added activities
  - **Control** processes so problems don't recur







**Purpose:** Define the project goals and customer (internal and external) deliverables.

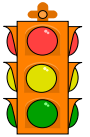
## Deliverables

- Define Customers and requirements (CTQs)
- Develop Problem Statement, Goals and Benefits
- Define Resources
- Evaluate Key Organizational Support
- Develop Project Plan and Milestones
- Develop High Level Process Map

## Tools Used

- Project Charter
- Process Flowchart
- SIPOC Diagram
- Stakeholder Analysis
- CTQ Definitions
- Voice of the Customer Gathering

Tollgate Review with  
Sponsor and Key  
Stakeholders



## Measure

**Purpose:** Measure the process to determine current performance; quantify the problem

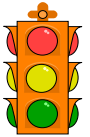
### Deliverables

- Define Defect, Opportunity, Unit and Metrics
- Detailed Process Map of Appropriate Areas
- Develop Data Collection Plan
- Validate the Measurement System
- Collect the Data
- Begin Developing  $Y=f(x)$  Relationship
- Determine Process Capability and Sigma Baseline

### Tools Used

- Process Flowchart
- House of Quality (QFD)
- Failure Modes and Effects Analysis (FMEA)
- Data Collection Plan/Example
- Benchmarking
- Measurement System Analysis/Gage R&R
- Voice of the Customer Gathering
- Process Sigma Calculation

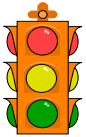
Tollgate Review with  
Sponsor and Key  
Stakeholders



## Analyze

**Purpose:** Analyze and determine the root cause(s) of the defects/variation/waste  
 $Y=f(x)$

Tollgate Review with  
Sponsor and Key  
Stakeholders



## Deliverables

- Define Performance Objectives
- Identify Value/Non-Value Added Process Steps
- Identify Sources of Variation
- Determine Root Cause(s)
- Determine Vital Few x's,  $Y=f(x)$  Relationship

## Tools Used

- Histogram/Pareto Chart
- Time Series/Run Chart
- Scatter Plot
- Regression Analysis
- Cause and Effect/Fishbone Diagram
- 5 Whys/ Process Map Review and Analysis
- Statistical Analysis/ Hypothesis Testing (Continuous and Discrete)
- Non-Normal Data Analysis

## Improve

**Purpose:** Improve the process by eliminating defects/variation/waste per project goals

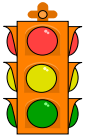
### Deliverables

- Perform Design of Experiments
- Develop Potential Solutions
- Define Operating Tolerances of Potential System
- Assess Failure Modes of Potential Solutions
- Validate Potential Improvement by Pilot Studies
- Correct/Re-Evaluate Potential Solution

### Tools Used

- Brainstorming
- Mistake Proofing
- Design of Experiments
- House of Quality (QFD)
- Failure Modes and Effects Analysis (FMEA)
- Simulation Software

Tollgate Review with  
Sponsor and Key  
Stakeholders



## Control

**Purpose:** Control future process performance, institutionalize the improvement, and ensure ongoing monitoring

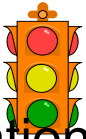
### Deliverables

- Define and Validate Monitoring and Control System
- Develop Standards and Procedures
- Implement Statistical Process Control
- Determine Process Capability
- Develop Transfer Plan, Handoff to Process Owner
- Verify Benefits, Cost Savings/Avoidance, Profit Growth
- Close Project, Finalize Documentation
- Communicate to Business, Celebrate

### Tools Used

- Process Sigma Calculation
- Control Charts (Variable and Attribute)
- Cost Savings Calculations
- Control Plan

Tollgate Review with  
Sponsor and Key  
Stakeholders



# The Goal: Completely Satisfying Customer Needs Profitably

**Honeywell**

Six Sigma quality focuses on a continuous and thorough understanding of our customer. We need to ensure our customers feel and see the benefits of Six Sigma quality at Honeywell

